

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Haiyun Yang		
Assignee	Legend Silicon Corporation		
Title:	Frame Identifier		
Serial No.:	10/040,185	Application Control No.:	9074
Examiner:	Cynthia L. Davis	Group Art Unit:	2616
Docket No.:	6024-008 (LSC-P008)	Filing Date:	October 19, 2001
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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**APPEAL BRIEF UNDER 37 CFR § 41.37**

Dear Sir:

Applicant submits this Appeal Brief pursuant to the Notice of Appeal filed in the present case on August 3, 2006, and a Pre-Brief Conference Request filed concurrently. Applicant received a Notice of Panel Decision from Pre-Appeal Brief Review, mailed on January 24, 2007, indicating the case should proceed to the Board of Patent Appeals and Interferences. Applicant has until February 24, 2007 (extended to February 26, 2007), to timely file this brief without extension of time fees.

This brief is filed with on-line payment of \$250.00, being the amount specified in 37 CFR 41.20(b)(2) for this Appeal Brief. The Commissioner is also authorized to deduct any other amounts required for this appeal brief and to credit any amounts overpaid to Deposit Account. No. 502226.

## **I. REAL PARTY IN INTEREST**

The real party in interest is the assignee, Legend Silicon Corporation, as named in the caption above.

## **II. RELATED APPEALS AND INTERFERENCES**

Based on information and belief, there are no appeals or interferences that could directly affect or be directly affected by or have a bearing on the decision by the Board of Patent Appeals in the pending appeal.

## **III. STATUS OF CLAIMS**

Claims 1-8 are pending in the present application. All claims stand rejected. Specifically, in the Final Office Action dated May 31, 2006, the Examiner maintained her rejection of claims 1-8 under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter.

The rejection of claims 1-8 is appealed. The pending claims are listed in the Claims Appendix below.

## **IV. STATUS OF AMENDMENTS**

No claim amendments were made after the Final Office Action.

## **V. SUMMARY OF CLAIMED SUBJECT MATTER**

The claimed invention provides a method to determine the unique frame number of a signal frame in a sequence of signal frames. In a communication system where a sequence of frames is transmitted with each frame uniquely identified by a frame number (or a frame ID), there is a need to determine the unique frame ID of each individual frame when the sequence of frames is received by a receiver. Determining the unique frame ID enables the receiver to process the received information correctly. As explained in Applicant's specification, page 1, lines 7-18:

**In certain communication systems that rely upon use of pseudo-noise techniques for signal discrimination, signals are transmitted within each of a sequence of frames, with each**

frame including a pseudo-noise preamble or post-amble section of a selected length L1 (expressed in bits or symbols) and a data section of length L2....

**What is needed is an approach that provides an identification of frame number** using a computable value associated with a pseudo-noise signal associated with a preamble (or post-amble) of the frame. **Preferably, this approach should provide a unique correspondence between a computable value and a frame id.** (Emphasis added.)

Thus, Applicant's specification set forth the problem needed to be solved – determining the unique frame ID of a signal frame in a sequence of frames.

The claimed invention solves a real world problem. A sequence of signal frames is transmitted over a communication channel and received at the receiver. Each of the frames in the sequence of signal frames has a unique frame number assigned. It is understood that the transmitted information may be corrupted by noise in the communication channel. The receiver must determine the frame ID of each frame so that the received information can be processed correctly. The present claims provide a method to “determine” this frame number. The present claims do not index the frames.

More specifically, claim 1 recites “**receiving a sequence of at least M+1 consecutive OFDM frames**...providing an overlap function...forming a selected pth order phase difference...**comparing the pth order difference...to determine a frame number** of at least one frame of the M+1 consecutive OFDM frames” (emphasis added). The claimed invention of claim 1 applies an “overlap function” and determines a selected pth order phase difference where the pth order phase difference is compared with a set of reference values to determine the unique frame number for each signal frame. (See generally, Applicant's specification, page 3, line 1, to page 4, line 27.) This “frame number” generated by the claimed method of claim 1 is a useful, concrete and tangible result of the claimed invention.

It is imperative to note that the term “determine a frame number” recited in claim 1 clearly indicates that the signal frame already has a frame number. After the signal frame is transmitted over a communication channel that may be noisy, it is now necessary to find out what the frame number of that signal frame is from the received signal frame. Therefore, the use of a mathematical function (the overlap function and forming a selected pth order phase difference) to determine the correct frame number of a received signal frame is a practical

application of the mathematical function as the computation is performed to generate a frame ID that is critical to the proper operation of a communication system.

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

1. Whether claims 1-8 recite statutory subject-matter under 35 U.S.C. §101.

## **VII. ARGUMENTS**

Claims 1-8 are pending in the present application of which Claim 1 is the only independent claim. In the Final Office Action dated May 31, 2006, the Examiner maintains her rejection of claims 1-8 under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter. (See Final Office Action, p.2.) In particular, the Examiner contends, among other things, that:

- (1) The claims are directed towards mathematical manipulations that have no tangible or concrete result;
- (2) The claims give no practical application for the recited steps; and
- (3) The instant claims merely mathematically index the frames in a signal, without performing any tangible physical result or change in the signal, and as such are not statutory subject matter. *Id.*

Applicant submits that the rejections of the independent claims and the associated dependent claims are improper for the following reasons.

### **1. Applicable Law**

35 U.S.C. §101 set forth four categories of subject matter for which a patent can be sought: processes, machines, manufacture and composition of matter. Although the Supreme Court held that Congress chose the expansive language of 35 U.S.C. §101 so as to include “anything under the sun that is made by man.” *Diamond v. Chakrabarty*, 447 U.S. 303, 308-09 (1980), patentable subject matter or statutory subject matter is subject to certain limits.

First, courts have found certain subject matter to be outside of, or exceptions to, the four statutory categories of inventions. It is now accepted that abstract ideas (such as

mathematical algorithms), laws of nature and natural phenomena are not patentable or statutory subject matter.

However, a subject matter that involves the practical application or use of an idea, a law of nature or a natural phenomenon may constitute patentable subject matter. See, e.g., *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. (20 Wall.) 498 (1874). See also, *MacKay Radio & Telegraph Co. v. Radio Corp. of America*, 306 U.S. 86, 94 (1939) (“While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.”)

“It is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.” *Diamond v. Diehr*, 450 U.S. 175, 187 (1981). Thus, “[w]hile a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.” *Diehr*, 450 U.S. at 188 (quoting *Mackay*, 306 U.S. at 94).

For claims including such excluded subject matter to constitute statutory subject matter, the claimed invention as a whole must accomplish a practical application. That is, it must produce a ‘useful, concrete and tangible result. See *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368, 1373 (Fed. Cir. 1998). Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention.

In the Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility (22 November 2005, “the Guidelines”), the USPTO draws on extensive case law to establish a framework for determining whether a claimed invention is directed to statutory subject matter. Specifically, a claimed invention is directed to a practical application of a 35 U.S.C. 101 judicial exception when it:

- (A) "transforms" an article or physical object to a different state or thing; or
- (B) otherwise produces a useful, concrete and tangible result.

Under the physical transformation test, if the claimed invention provides a transformation or reduction of an article to a different state or thing, then the claim meets the

statutory requirement of 35 U.S.C. §101. If the claim invention does not provide a physical transformation, the claim may still be eligible for patent protection if the claimed invention produces a useful, concrete, and tangible result. See, the Guidelines.

In determining whether the claim is for a “practical application,” the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the final result achieved by the claimed invention is “useful, tangible and concrete.” The claim must be examined to see if it includes anything more than a Sec. 101 judicial exception. If the claim is directed to a practical application of the Sec. 101 judicial exception producing a result tied to the physical world that does not preempt the judicial exception, then the claim meets the statutory requirement of 35 U.S.C. §101.

Even when a claim applies a mathematical formula, for example, as part of a seemingly patentable process, the claim may still be ineligible for patent protection if in reality it “seek[s] patent protection for that formula in the abstract.” *Diehr*, 450 U.S. at 191. One may not patent a process that comprises every “substantial practical application” of an abstract idea, because such a patent “in practical effect would be a patent on the [abstract idea] itself.” *Gottschalk v. Benson*, 409 U.S. 63, 71-72 (1972). See also, *Diehr*, 450 U.S. at 187, 209 USPQ at 8 (stressing that the patent applicants in that case did “not seek to pre-empt the use of [an] equation,” but instead sought only to “foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process”).

With regard to the “useful, concrete, and tangible result” requirement, an invention is useful if it satisfy the utility requirement of §101. That is, the utility of the invention has to be specific, substantial and credible. The tangible prone requires that the claim must recite more than a §101 judicial exception, in that the process claim must set forth a practical application of that §101 judicial exception to produce a real-world result. Finally, the concrete prone requires that a result can be substantially repeatable or the process must substantially produce the same result again. *In re Swartz*, 232 F.3d 862, 864 (Fed. Cir. 2000) (where asserted result produced by the claimed invention is “irreproducible” claim should be rejected under section 101).

With regard to computer-related inventions, several cases are of interest. In *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352 (Fed. Cir. 1999), claims drawn to a long-

distance telephone billing process containing mathematical algorithms were held to be directed to patentable subject matter because “the claimed process applies the Boolean principle to produce a useful, concrete, tangible result without pre-empting other uses of the mathematical principle.” *AT&T*, at 1358. In the *AT&T* case, the claimed invention of the patent is “a message record for long-distance telephone calls that is enhanced by adding a primary interexchange carrier (“PIC”) indicator. The addition of the indicator aids long-distance carriers in providing differential billing treatment for subscribers, depending upon whether a subscriber calls someone with the same or a different long-distance carrier... The PIC indicator therefore enables IXCs to provide differential billing for calls on the basis of the identified PIC.” *AT&T*, at 1353-1354.

In the *State Street* case, the court held that “transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces ‘a useful, concrete and tangible result’ – a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.” *State Street*, 149 F.3d at 1373.

Finally, “when evaluating the scope of a claim, every limitation in the claim must be considered. The Examiner may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered.” See, e.g., *Diamond v. Diehr*, 450 U.S. at 188-89 (“In determining the eligibility of respondents’ claimed process for patent protection under §101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis.”)

## **2. Claim 1 Recites a Practical Application**

The claimed invention of claim 1 recites a method for a practical application of a mathematical function and is therefore directed to statutory subject matter under 35 U.S.C. §101. The claimed invention of claim 1 has substantial practical application in communication systems and provides results that have real world values.

First, the claimed invention of claim 1 is directed to a practical application of a mathematical function because it transforms a physical object to a different thing.

Second, the claimed invention of claim 1 is directed to a practical application of a mathematical function because it produces a useful, concrete and tangible result.

### **3. Claim 1 Recites a Physical Transformation of the Received Signal**

Claim 1 recites “receiving a sequence of...OFDM frames” and “determin[ing] a frame number of at least one frame of the...OFDM frames.” Thus, claim 1 receives an incoming sequence of signal frames and uses the overlap function and p-th order phase differences to transform the incoming sequence of signal frames into frame ID numbers for each of the frames. Therefore, claim 1 recites a method where a transformation of a physical object – signal frames – to a different thing – a frame ID value – is realized. For this reason alone, claim 1 recites statutory subject matter.

The Examiner contends in the Final Office Action that the “instant claims **merely mathematically index** the frames in a signal, without performing any tangible physical result or change in the signal” (emphasis added). The Examiner’s characterization of the present claims as “indexing the frames” is in error. The “indexing” interpretation of the claims is a fiction created by the Examiner without any support from the claim language or from Applicant’s specification. Under the Merriam-Webster dictionary definition, the word “index” as a verb means “to provide with an index or “to list in an index”. Nowhere in the claims or in Applicant’s specification is indexing the signal frames described. The claimed invention of claim 1 does not “index” the signal frames but rather determine the frames’ unique frame ID numbers.

In arriving at the “indexing” interpretation of the claims, the Examiner **did not consider each claim as a whole** and **did not** interpret the claims in view of Applicant’s specification. “When evaluating the scope of a claim, **every limitation in the claim must be considered**. Office personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, **the claim as a whole must be considered**.” *Diamond v. Diehr*, 450 U.S. at 188-89 (emphasis added). The Examiner somehow injected the “indexing” meaning into the present claims and contends that the claims do not provide any physical transformation of a physical object. The Examiner is in error. Claim 1 does not merely index incoming signal frames. Claim 1 recites a physical transformation from a received signal frame to a frame ID number. Claim 1 is directed to statutory subject matter.



#### **4. Claim 1 Recites a Useful, Concrete and Tangible Result**

Claim 1 applies a mathematical function to a received signal frame to generate the frame ID for that signal frame. The problem solved by the claimed invention is to accurately determine the frame number of the received frames. The claimed invention provides a method to uniquely identify each frame in the received signal frames. The identification of the unique frame number of each signal frame in a sequence of signal frames is a useful, concrete and tangible result of the claimed invention.

Applicant's claimed invention is similar to the *AT&T* case and the *State Street* case both of which are well-known examples of inventions having a practical application because they produce useful, concrete, and tangible results.

In the *AT&T* case, the claimed invention of the patent is "a message record for long-distance telephone calls that is enhanced by adding a primary interexchange carrier ('PIC') indicator. The addition of the indicator aids long-distance carriers in providing differential billing treatment for subscribers, depending upon whether a subscriber calls someone with the same or a different long-distance carrier...The PIC indicator therefore enables IXCs to provide differential billing for calls on the basis of the identified PIC." *AT&T*, at 1353-1354.

In the *State Street* case, the claimed invention of the patent is directed to the "transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price." *State Street*, 149 F.3d at 1373.

Just as in the cases of *AT&T* and *State Street*, the claimed invention of claim 1 receives information, processes the information and generates a useful, concrete and tangible result in the form of a **frame number** which may be temporarily stored and then used or relied upon by other parts of a communication system. Therefore, the claimed invention of claim 1 **as a whole** provides a useful, concrete and tangible result and accomplishes a practical application.

More specifically, the result of the claimed method is a frame ID that is used to ensure correct processing of the received signal frames. The result of the claimed method is therefore useful. The frame ID provided through the operation of the claimed method is a real world result because the frame ID is needed by the receiver to properly process the received information. Finally, the frame ID generated by the claim method is concrete as the result is

repeatable and reproducible. That is, the mathematical function in claim 1 will give the same frame ID results for the same received signal frame. Hence, claim 1 provides a useful, concrete and tangible result and recites statutory subject matter under 35 U.S.C. §101.

#### **5. No Preemption**

The claimed invention of claim 1 is directed to OFDM signal frames. The mathematical function in claim 1 is applied to a sequence of consecutive OFDM frames. The claimed invention does not cover every substantial practical application of the mathematical function in claim 1 and does not preclude the use of the mathematical function in other applications. In other words, the claimed invention of claim 1 does not attempt to claim the mathematical function in the abstract or to cover all possible use of the mathematical function. Rather, the claimed invention is directed to one specific and practical application of the mathematical function for processing OFDM signal frames. The claimed invention does not seek to preempt the use of the mathematical function in claim 1 but only sought to foreclose from others the use of the function in claim 1 in conjunction with all of the other steps in the claimed method. For this additional reason, claim 1 is directed to statutory subject matter.

#### **6. Claims 1-8 meet the Statutory Subject Matter requirement**

The claimed invention of claim 1 receives information, processes the information and generates a useful, concrete and tangible result in the form of a *frame number of each frame* which may be temporarily stored and then used or relied upon by other parts of a communication system. Therefore, the claimed invention of claim 1 *as a whole* provides a physical transformation of the received signal, provides a useful, concrete and tangible result and accomplishes a practical application. Hence, claim 1 recites statutory subject matter under 35 U.S.C. §101.

Claims 2-8, dependent upon claim 1, recite statutory subject matter under 35 U.S.C. §101 for the same reasons as independent claim 1.

## **VIII. CONCLUSION**

For the above reasons, Applicant respectfully submits that rejection of pending claims 1-8 is unfounded. Accordingly, Applicant requests that the rejection of claims 1-8 be reversed.

### Certificate of Electronic Transmission

I hereby certify that this correspondence is being submitted electronically to the United States Patent and Trademark Office using EFS-Web on the date shown below.

/Carmen C Cook/	February 20, 2007
Attorney for Applicant(s)	Date of Signature

Respectfully submitted,

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## CLAIMS APPENDIX

### Claims on Appeal

1. (Previously Presented) A method for determining a number of a frame in a sequence of two or more frames, the method comprising:

receiving a sequence of at least M+1 consecutive OFDM frames, each frame having an index m, having a designated preamble wherein the designated preamble has a selected length N1 and an associated pseudo-noise signal PN(t;m) (m = 0, ... , M; M≥1);

providing an overlap function OF(m;k) of the designated preambles with each of a sequence of selected reference signals, indexed by k = 1, 2, ... , K where K is a selected integer, and determining a phase  $\phi(m)$  corresponding to a location of a maximum amplitude of the overlap functions OF(m;k) for each of the M+1 designated preambles of the sequence of at least M+1 consecutive OFDM frames;

forming a selected pth order phase difference of the phases  $\phi(m)$ ; and

comparing the pth order difference with a selected table of pth order phase differences to determine a frame number of at least one frame of the M+1 consecutive OFDM frames, the frame number uniquely identifying the at least one frame in the M+1 consecutive OFDM frames.

2. (Previously Presented) The method of claim 1, further comprising choosing p = 1 and choosing said first-order phase difference to be  $\Delta_1(m) = \phi(m+1) - \phi(m)$ .

3. (Previously Presented) The method of claim 1, further comprising choosing p = 3 and choosing said third-order phase difference to be  $\Delta_3(m) = \phi(m+3) - 3\phi(m+2) + 3\phi(m+1) - \phi(m)$ .

4. (Previously Presented) The method of claim 1, further comprising choosing p to be an odd integer.

5. (Original) The method of claim 1, further comprising forming a linear combination

$$LC(m) = \sum_{p=1}^P c(p) \cdot \Delta_p(m) \quad (P \geq 2),$$

where  $c(p)$  are selected coefficients, at least one of which is non-zero; and  
comparing the linear combination value  $LC(m)$  with a selected table of linear combination values to determine a frame number of at least one of the  $M+1$  frames.

6. (Original) The method of claim 1, further comprising providing at least two of said pseudo-noise signals,  $PN(t;m1)$  and  $PN(t;m2)$ , as translations of each other through a relation  $PN(t;m2) = PN(t + \Delta t(m1,m2);m1)$ , where  $\Delta t(m1,m2)$  is a selected time difference depending upon at least one of said indices  $m1$  and  $m2$ .

7. (Original) The method of claim 1, further comprising:  
computing a first order sum  $\sum_1(m) = \phi(m+1) + \phi(m)$  for at least one index number  $m$ ;  
and  
when the sum  $\sum_1(m)$  is not equal to at least one of the numbers  $+1$  and  $-1$ , adjusting a value of at least said phases  $\phi(m)$  and  $\phi(m+1)$  so that the sum  $\sum_1(m)$  is equal to one of the numbers  $+1$  and  $-1$ .

8. (Original) The method of claim 1, further comprising choosing at least one of said selected reference signals to be an  $m$ -sequence.

**EVIDENCE APPENDIX**

NONE

**RELATED PROCEEDINGS APPENDIX**

NONE